Please put away all papers and electronic devices except a calculator. Show enough work that it is clear how you arrived at your answer. Correct answers with no work shown will not receive full credit. Box/circle your final answers. Good luck!

1. (10 points) Suppose 20% of apartments that are owned have a doorman, and 4% of apartments that are rented have a doorman. If 25% of apartments are owned and 75% are rented, what percentage of apartmets (overall) have a doorman?

2. Suppose that on a particular day, 15% of CCNY students drove to school, 75% took the subway, and 10% walked or rode a bike. Furthermore, 10% of those who drove to school were late, 20% of those who toook the subway were late, and 5% of those who walked or biked were late.

   (a) (8 points) Find the probability that a CCNY student was late on this day.

   (b) (10 points) If a student was late, what is the probability that they took the subway to school?

3. Every time you play a Youtube video, a video ad plays. Suppose the ad is chosen randomly and 30% of ads are 5 seconds long, 45% are 15 seconds long, and 25% are 30 seconds long. Let x equal the length of the randomly selected ad in seconds.

   (a) (8 points) Describe the probability distribution $p(x)$ by filling in the chart below.

x			
$p(x)$			

   (b) (8 points) Calculate the expected value $E(x)$ for x.

4. A raffle is being held in which 600 tickets are sold for $5 each. There is 1 first prize of $1500 and there are 2 second prizes of $500 each. All other tickets receive no prize ($0). Let x equal the net gain/loss from buying one ticket, that is

$$x = \text{prize money} - 5.$$

   (a) (8 points) Describe the probability distribution $p(x)$ by filling in the chart below.

x			
$p(x)$			

   (b) (8 points) Calculate the expected value $E(x)$ for x.

5. (10 points) If a fair coin is flipped 9 times, find the probability that exactly 3 heads are observed.

6. In a certain laboratory, every bacterial culture has a 15% chance of becoming contaminated, independent of the other cultures. Suppose this lab grows 30 bacterial cultures. Let x equal the number of contaminated cultures.

   (a) (8 points) Find the probability that exactly $x = 4$ of the cultures become contaminated.

   (b) (5 points) Find the expected value $E[x] = \mu$ for the number of contaminated cultures x.

   (c) (5 points) Find the standard deviation σ for the number of contaminated cultures x.

7. (12 points) Suppose a shipment of 12 computer monitors contains 7 standard monitors and 5 high-definition monitors. Three computer monitors are selected at random. Let x be the number of high-definition montors selected. Describe the probability distribution $p(x)$ by filling in the chart below.

x	
$p(x)$	